Stata 統計軟體教育訓練課程

統合分析 Meta-analysis

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授課日期：112年12月19日

為什麼要進行Meta-analysis?

統合多個臨床研究的樣本數和結果，證據力高
花費研究經費和人力相對低

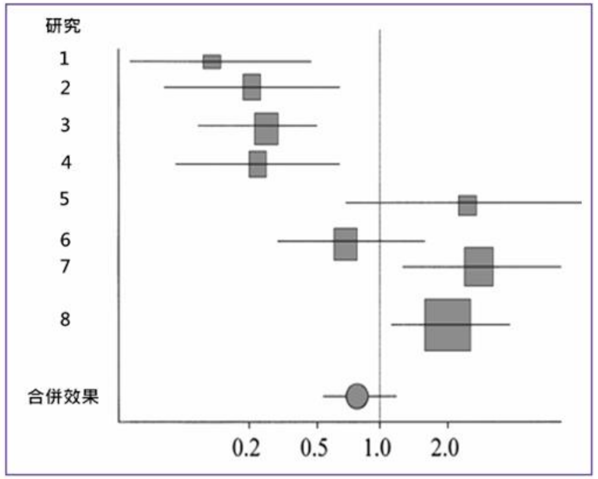
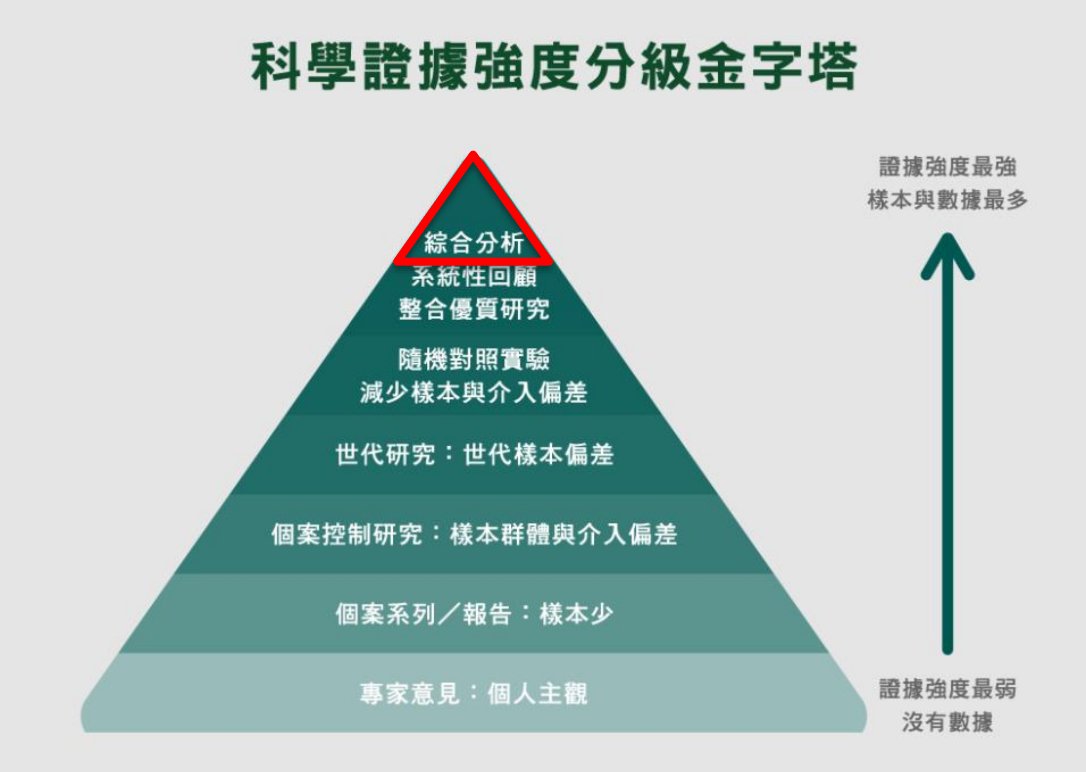


圖2 統合分析中呈現不同研究結果的明顯差異性



Quick Tutorial to Stata

To Install and update the metan module in Stata 9.0 ↑
(因為舊版每次都要更新)

1

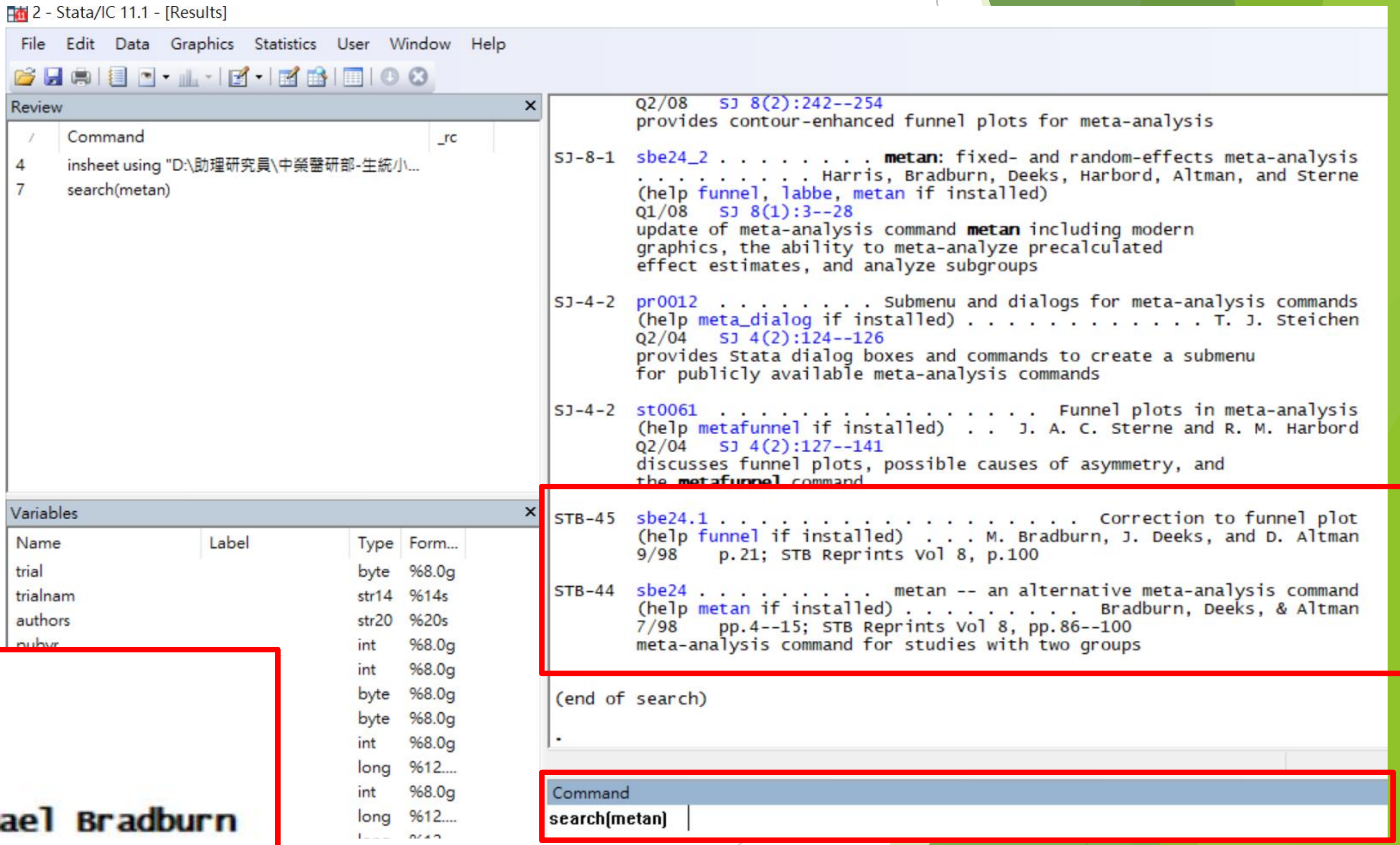
Command
search(metan)

2

Under STB-44, click on sbe24
Under STB-45, click on sbe24.1
(按—more—或空白鍵，可以到下一頁)

3 若 metan 不是最新版本，輸入指令：
which metan
ssc install metaaggr, all replace

```
. which metan
c:\ado\plus\m\metan.ado
*! version 4.06  12oct2022
*! Current version by David Fisher
*! Previous versions by Ross Harris and Michael Bradburn
```



4 若需要指令的協助： **help (metan)**

Introduction to the “metan” Module

insheet using "C:\Users\VGH00\Downloads\20231219-初探Meta-analysis\data\bcg.csv", clear

For binary (count) data:
4 variables (2*2 data)

1. the number of **events** in the treatment group (tcases)
2. the number of **non-events** in the treatment group (tnoncases)
3. the number of **events** in the control group (ccases)
4. the number of **non-events** in the control group (cnoncases)

1 2 3 4

In the command window type: **metan tcases tnoncases ccases cnoncases**

(1~4 順序不可以變動，名稱可隨意更改)

	trial	trialnam	authors	pubyr	startyr	latitude	alloc	tcases	tnoncases	ccases	cnoncases	ttotal	ctotal
1	2	Canada	Ferguson & Simes	1949	1933	55	1	6	300	29	274	306	303
2	1	Northern USA	Aronson	1948	1935	52	1	4	119	11	128	123	139
3	8	Chicago	Rosenthal et al	1961	1941	42	0	17	1699	65	1600	1716	1665
4	10	Georgia (Sch)	Comstock & Webster	1969	1947	33	0	5	2493	3	2338	2498	2341
5	9	Puerto Rico	Comstock et al	1974	1949	18	0	186	50448	141	27197	50634	27338
6	11	Georgia (Comm)	Comstock et al.	1976	1950	33	0	27	16886	29	17825	16913	17854
7	4	Madanapalle	Frimont-Moller et al	1973	1950	13	0	33	5036	47	5761	5069	5808
8	3	UK	Hart & Sutherland	1977	1950	53	1	62	13536	248	12619	13598	12867
9	7	South Africa	Coetzee & Berjak	1968	1965	27	1	29	7470	45	7232	7499	7277
10	5	Haiti	Vandeviere et al	1973	1965	18	1	8	2537	10	619	2545	629
11	6	Madras	TB Prevention Trial	1980	1968	13	1	505	87886	499	87892	88391	88391
12	12	Unknown	Rosenthal et al	1960	1945	42	1	3	228	11	209	231	220
13	13	Unknown	Stein and Aronson	1953	1940	52	0	180	1361	372	1079	1541	1451

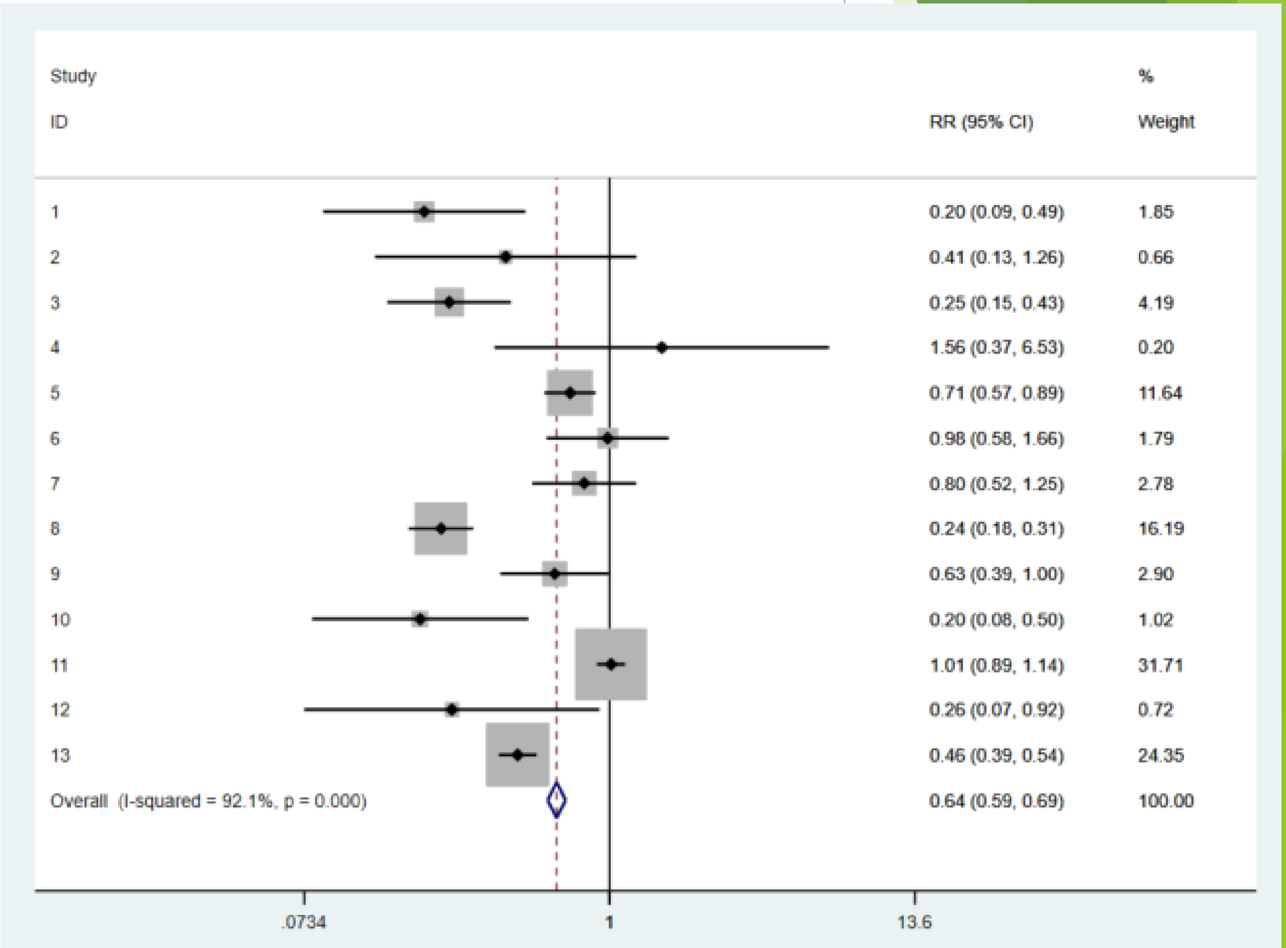
Introduction to the “metan” Module

For binary (count) data:
4 variables (2*2 data)

insheet using "C:\Users\VGH00\Downloads\20231219-初探Meta-analysis\data\bcg.csv", clear

metan tcases tnoncases ccases cnoncases

```
. metan tcases tnoncases ccases cnoncases

         Study     |     RR    [95% Conf. Interval]     % Weight
---------------------+---------------------------------------------------
1                    |  0.205      0.086     0.486          1.85
2                    |  0.411      0.134     1.257          0.66
3                    |  0.254      0.149     0.431          4.19
4                    |  1.562      0.374     6.528          0.20
5                    |  0.712      0.573     0.886         11.64
6                    |  0.983      0.582     1.659          1.79
7                    |  0.804      0.516     1.254          2.78
8                    |  0.237      0.179     0.312         16.19
9                    |  0.625      0.393     0.996          2.90
10                   |  0.198      0.078     0.499          1.02
11                   |  1.012      0.895     1.145         31.71
12                   |  0.260      0.073     0.919          0.72
13                   |  0.456      0.387     0.536         24.35
---------------------+---------------------------------------------------
M-H pooled RR        |  0.635      0.588     0.686        100.00
---------------------+---------------------------------------------------

  Heterogeneity chi-squared = 152.57 (d.f. = 12) p = 0.000
  I-squared (variation in RR attributable to heterogeneity) =  92.1%

  Test of RR=1 : z=  11.53 p = 0.000
```



Introduction to the “metan” Module

For binary (count) data:
4 variables (2*2 data)

```
insheet using "C:\Users\VGH00\Downloads\20231219-初探Meta-analysis\data\bcg.csv", clear
```

```
metan tcases tnoncases ccases cnoncases
```

若需要指令的協助： help (metan)

rr pools risk ratios **(the default)**.
or pools odds ratios.
rd pools risk differences.
fixed specifies a fixed effect model using the method of Mantel and Haenszel **(the default)**. For 4-variable data
fixedi specifies a fixed effect model using the inverse variance method. For 4- or 2-variable data
peto specifies that Peto's method is used to pool odds ratios. (For 4-variable data, zero cells)
random specifies a random effects model using the method of DerSimonian & Laird, with the estimate of heterogeneity being taken from the from the Mantel-Haenszel model. For 4-variable data
randomi specifies a random effects model using the method of DerSimonian & Laird, with the estimate of heterogeneity being taken from the inverse-variance fixed-effect model. For 4- or 2-variable data

Introduction to the "metan" Module

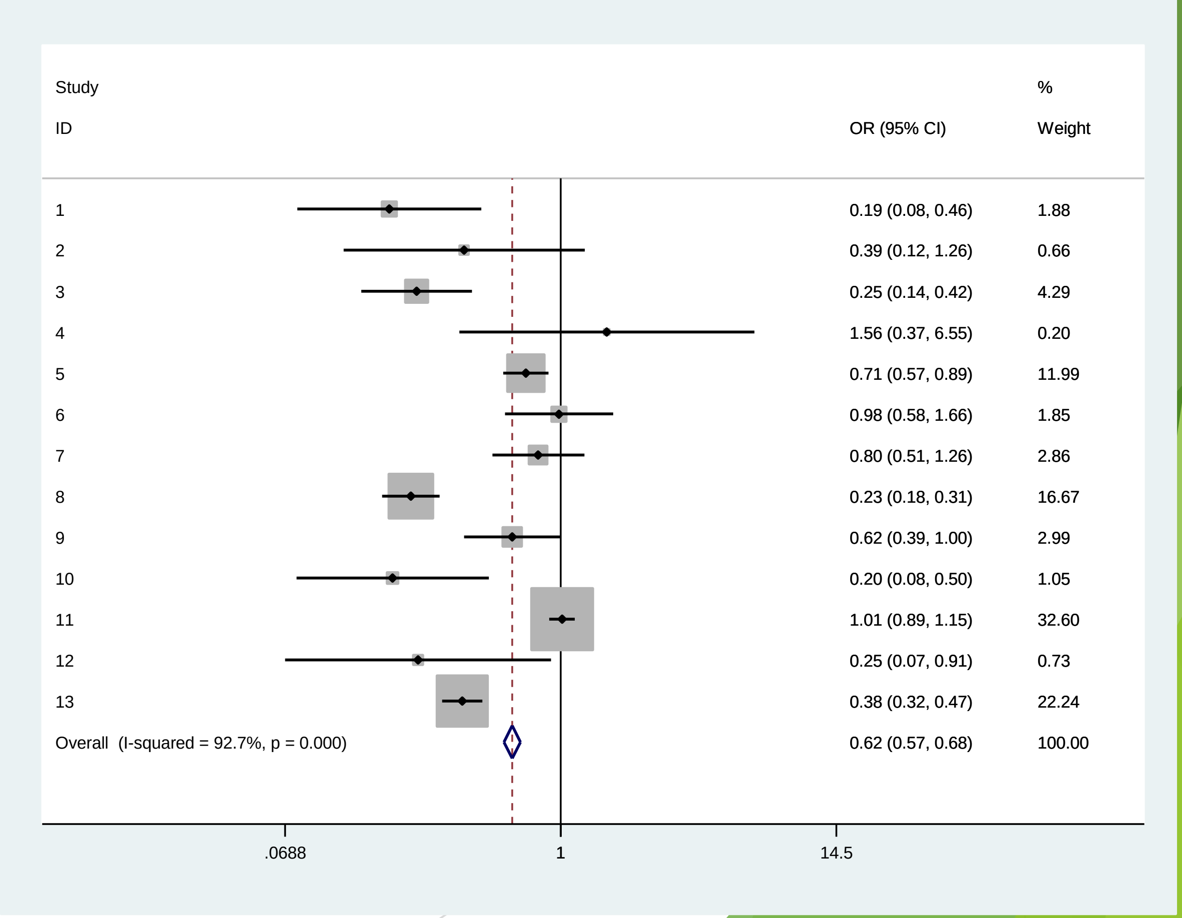
For binary (count) data:
4 variables (2*2 data)

insheet using "C:\Users\VGH00\Downloads\20231219-初探Meta-analysis\data\bcg.csv", clear

metan tcases tnoncases ccases cnoncases, or random

Random effect

```
. metan tcases tnoncases ccases cnoncases, or random

           Study     |     OR   [95% Conf. Interval]     % Weight
---------------------+---------------------------------------------------
1                    |  0.189      0.077     0.462         6.44
2                    |  0.391      0.121     1.262         5.12
3                    |  0.246      0.144     0.422         8.37
4                    |  1.563      0.373     6.548         4.11
5                    |  0.711      0.571     0.886         9.75
6                    |  0.983      0.582     1.661         8.44
7                    |  0.803      0.514     1.256         8.83
8                    |  0.233      0.176     0.308         9.55
9                    |  0.624      0.391     0.996         8.73
10                   |  0.195      0.077     0.497         6.24
11                   |  1.012      0.894     1.146         9.97
12                   |  0.250      0.069     0.908         4.63
13                   |  0.384      0.316     0.466         9.82
---------------------+---------------------------------------------------
D+L pooled OR        |  0.474      0.325     0.691       100.00
---------------------+---------------------------------------------------

  Heterogeneity chi-squared = 163.94 (d.f. = 12) p = 0.000
  I-squared (variation in OR attributable to heterogeneity) =  92.7%
  Estimate of between-study variance Tau-squared =  0.3682

  Test of OR=1 : z=   3.88 p = 0.000
```



Introduction to the “metan” Module

For binary (count) data:
4 variables (2*2 data)

insheet using "C:\Users\VGH00\Downloads\20231219-初探Meta-analysis\data\bcg.csv", clear

四組數字： tcases tnoncases ccases cnoncases

metan tcases tnoncases ccases cnoncases

兩組數字： logRR, selogRR
gen logRR = ln((tcases/ttotal) / (ccases/ctotal))
gen selogRR = sqrt(1/tcases +1/ccases -1/ttotal -1/ctotal)

--Two variables: **metan loges seloges**
metan logRR selogRR
(log, effect sizes)(standard error, log, effect sizes)

三組數字: RR, UL, LL
3組數字轉2組數字
gen logrr=ln(rr)
gen selogrr=(ln(ul)-ln(ll))/3.92

insheet using "C:\Users\VGH00\Downloads\20231219-初探Meta-analysis\data\nodm.csv", clear

--Three variables: **metan loges logll logul**
metan rr ll ul
(log, effect sizes)(log, lower and upper limits)

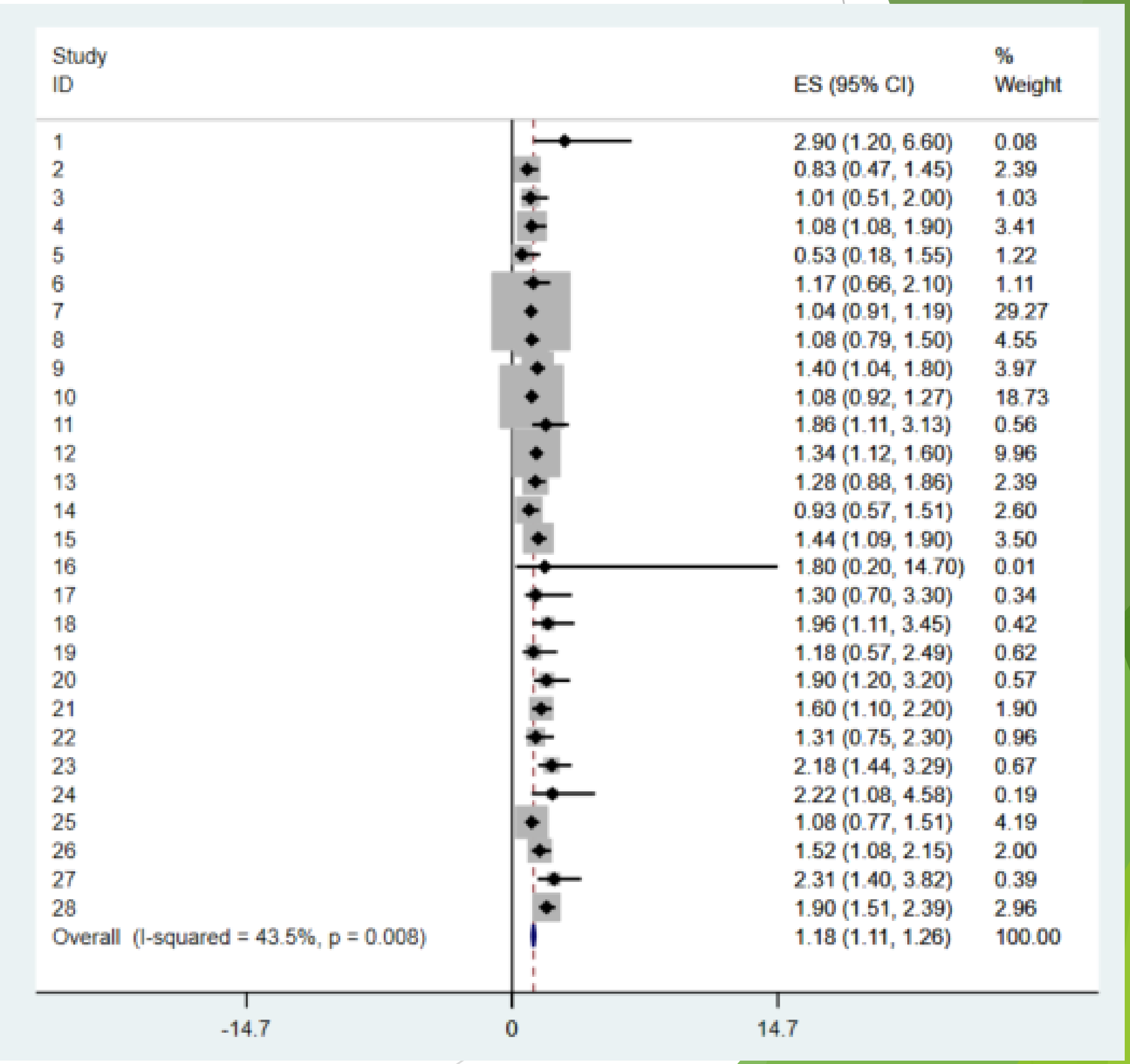
Introduction to the “metan” Module

For binary (count) data:
3 variables

insheet using "C:\Users\VGH00\Downloads\20231219-初探Meta-analysis\data\nodm.csv", clear

metan rr ll ul

```
. metan rr ll ul

          Study     |     ES    [95% Conf. Interval]     % Weight
--------------------+---------------------------------------------------
1                   |  2.900     1.200     6.600          0.08
2                   |  0.830     0.470     1.450          2.39
3                   |  1.010     0.510     2.000          1.03
4                   |  1.080     1.080     1.900          3.41
5                   |  0.530     0.180     1.550          1.22
6                   |  1.170     0.660     2.100          1.11
7                   |  1.040     0.910     1.190         29.27
8                   |  1.080     0.790     1.500          4.55
9                   |  1.400     1.040     1.800          3.97
10                  |  1.080     0.920     1.270         18.73
11                  |  1.860     1.110     3.130          0.56
12                  |  1.340     1.120     1.600          9.96
13                  |  1.280     0.880     1.860          2.39
14                  |  0.930     0.570     1.510          2.60
15                  |  1.440     1.090     1.900          3.50
16                  |  1.800     0.200    14.700          0.01
17                  |  1.300     0.700     3.300          0.34
18                  |  1.960     1.110     3.450          0.42
19                  |  1.180     0.570     2.490          0.62
20                  |  1.900     1.200     3.200          0.57
21                  |  1.600     1.100     2.200          1.90
22                  |  1.310     0.750     2.300          0.96
23                  |  2.180     1.440     3.290          0.67
24                  |  2.220     1.080     4.580          0.19
25                  |  1.080     0.770     1.510          4.19
26                  |  1.520     1.080     2.150          2.00
27                  |  2.310     1.400     3.820          0.39
28                  |  1.900     1.510     2.390          2.96
--------------------+---------------------------------------------------
I-V pooled ES       |  1.183     1.107     1.259        100.00
--------------------+---------------------------------------------------
 Heterogeneity calculated by formula
  Q = SIGMA_i{ (1/variance_i)*(effect_i - effect_pooled)^2 }
where variance_i = ((upper limit - lower limit)/(2*z))^2

  Heterogeneity chi-squared =  47.79 (d.f. = 27) p = 0.008
  I-squared (variation in ES attributable to heterogeneity) =  43.5%

  Test of ES=0 : z=  30.62 p = 0.000
```



Introduction to the “metan” Module

For binary (count) data:

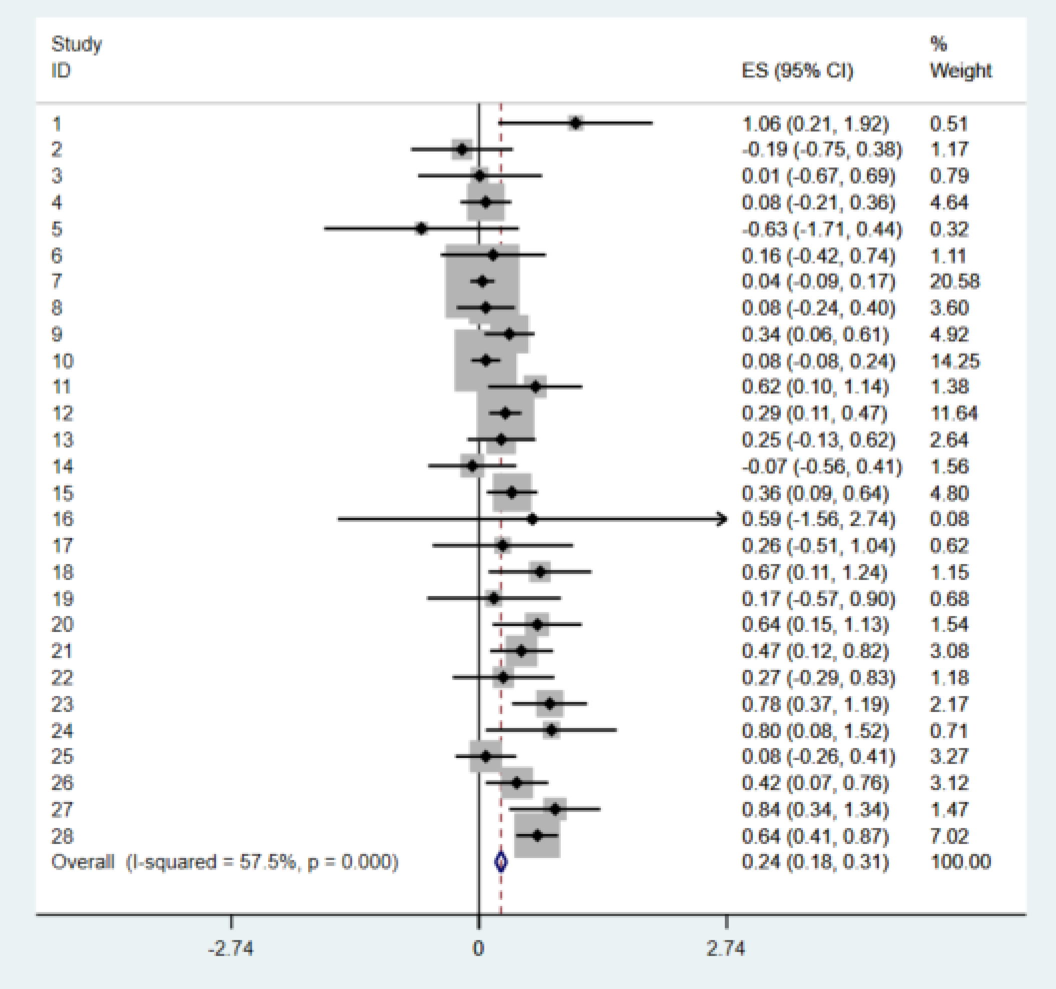
3組數字轉2組數字

gen logrr=ln(rr)

gen selogrr=(ln(ul)-ln(ll))/3.92

insheet using "C:\Users\VGH00\Downloads\20231219-初探Meta-analysis\data\nodm.csv", clear

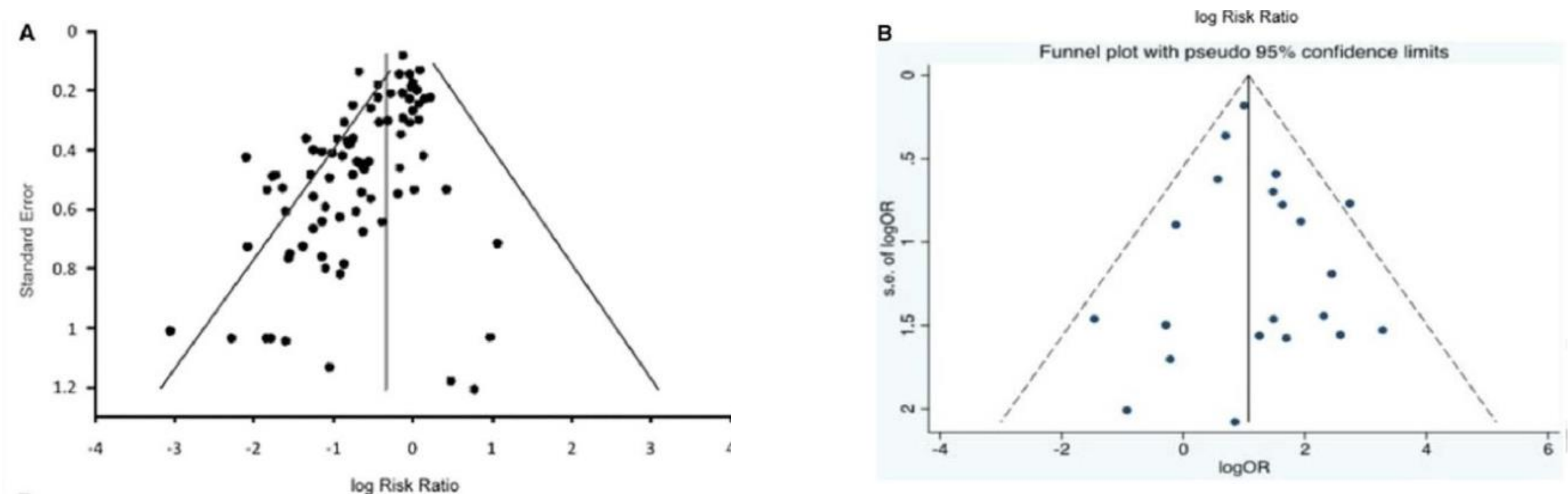
metan logrr selogrr




```
. gen logrr=ln(rr)

.
. gen selogrr=(ln(ul)-ln(ll))/3.92

. metan logrr selogrr

           Study     |     ES    [95% Conf. Interval]     % Weight
---------------------+---------------------------------------------------
1                    |  1.065       0.212     1.917          0.51
2                    | -0.186      -0.750     0.377          1.17
3                    |  0.010      -0.673     0.693          0.79
4                    |  0.077      -0.205     0.359          4.64
5                    | -0.635      -1.711     0.442          0.32
6                    |  0.157      -0.422     0.736          1.11
7                    |  0.039      -0.095     0.173         20.58
8                    |  0.077      -0.244     0.398          3.60
9                    |  0.336       0.062     0.611          4.92
10                   |  0.077      -0.084     0.238         14.25
11                   |  0.621       0.102     1.139          1.38
12                   |  0.293       0.114     0.471         11.64
13                   |  0.247      -0.127     0.621          2.64
14                   | -0.073      -0.560     0.415          1.56
15                   |  0.365       0.087     0.642          4.80
16                   |  0.588      -1.561     2.736          0.08
17                   |  0.262      -0.513     1.038          0.62
18                   |  0.673       0.106     1.240          1.15
19                   |  0.166      -0.572     0.903          0.68
20                   |  0.642       0.151     1.132          1.54
21                   |  0.470       0.123     0.817          3.08
22                   |  0.270      -0.290     0.830          1.18
23                   |  0.779       0.366     1.192          2.17
24                   |  0.798       0.075     1.520          0.71
25                   |  0.077      -0.260     0.414          3.27
26                   |  0.419       0.074     0.763          3.12
27                   |  0.837       0.335     1.339          1.47
28                   |  0.642       0.412     0.871          7.02
---------------------+---------------------------------------------------
I-V pooled ES        |  0.245       0.184     0.305        100.00
---------------------+---------------------------------------------------

  Heterogeneity chi-squared =  63.52 (d.f. = 27) p = 0.000
  I-squared (variation in ES attributable to heterogeneity) =  57.5%

  Test of ES=0 : z=   7.88 p = 0.000
```

圖像化評估 Publication Bias: Funnel Plot

「出版性偏差」（publication bias）：研究的質素相若，但報告較大效應值的大型研究，相比於報告較小、或沒有效應的小型研究更常被發表出版的情況。
「出版性偏差」的風險：會令綜合性的研究並不能準確地代表某主題的所有研究，而只偏重於較極端的結果。



漏斗圖：(A) 有出版性偏差、(B) 無出版性偏差

Introduction to the “metafunnel” Module

圖像化評估Publication Bias: Funnel Plot

search(metafunnel)
search(metabias)

insheet using "C:\Users\VGH00\Downloads\20231219-初探Meta-analysis\data\afreg.csv“, clear

	year	study	rotor_n	rotor_t	pvi_n	pvi_t	logor	selogor	logrr	selogrr	weight	or	gp	af_duratio~h	age	male	htn	dm	lad
1	2012	Narayan S., 2012	10	34	42	69	-1.3173	.45	-.7273	.2827	14.30%	0.27 [0.11, 0.65]	0	45	61	95.77465	70	31	43
2	2014	Haissaguerre M., 2014	11	82	22	82	-.8615	.4088	-.6931	.3346	13.90%	0.42 [0.19, 0.94]	0	4.890244	57.5	80.5	.	.	.
3	2014	Atienza F., 2014 (Persistent)	27	58	31	58	-.2763	.3723	-.1382	.1866	12.10%	0.76 [0.37, 1.57]	0	15.84	54	81	34	9	45
4	2014	Atienza F., 2014 (Paxoxysmal)	23	55	26	58	-.1226	.3801	-.0695	.2157	10.70%	0.88 [0.42, 1.86]	0	49.56	53	84	29	3	40
5	2016	Lin Y.J., 2016	11	34	19	34	-.974	.5037	-.5465	.2911	9.40%	0.38 [0.14, 1.01]	0	5.3	54	76.5	50	5.9	39
6	2016	Jadidi A.S., 2016	17	85	35	66	-1.5077	.3666	-.9751	.2459	23.00%	0.22 [0.11, 0.45]	0	.	59	49	38	.	46
7	2017	Seitz J., 2017	47	105	30	47	-.7783	.3615	-.3549	.1543	16.70%	0.46 [0.23, 0.93]	0	19.4	58	74	42.5	10.6	42.4
8	2016	Sommer P.J., 2016	.	.	.	.	.	.	.	.			0	18.4	64.1	68	.	.	42.2
9	2012	Narayan S., 2012	10	34	42	69	-1.3173	.45	-.7273	.2827	14.30%	0.27 [0.11, 0.65]	1	52	63	94.44444	86	33	48
10	2014	Haissaguerre M., 2014	11	82	22	82	-.8615	.4088	-.6931	.3346	13.90%	0.42 [0.19, 0.94]	1	4.890244	60.1	80.5	.	.	.
11	2014	Atienza F., 2014 (Persistent)	27	58	31	58	-.2763	.3723	-.1382	.1866	12.10%	0.76 [0.37, 1.57]	1	18	55	81	39	14	45
12	2014	Atienza F., 2014 (Paxoxysmal)	23	55	26	58	-.1226	.3801	-.0695	.2157	10.70%	0.88 [0.42, 1.86]	1	43.92	54	73	44	5	40
13	2016	Lin Y.J., 2016	11	34	19	34	-.974	.5037	-.5465	.2911	9.40%	0.38 [0.14, 1.01]	1	7.06	56	79.4	47.1	17.6	39.9
14	2016	Jadidi A.S., 2016	17	85	35	66	-1.5077	.3666	-.9751	.2459	23.00%	0.22 [0.11, 0.45]	1	.	63	55	52	.	44
15	2017	Seitz J., 2017	47	105	30	47	-.7783	.3615	-.3549	.1543	16.70%	0.46 [0.23, 0.93]	1	12.2	63	76.2	45.7	12.4	45.6
16	2016	Sommer P.J., 2016	.	.	.	.	.	.	.	.			1	68.5	60.9	70	.	.	45.9

gen logRR = ln((tcases/ttotal) / (ccases/ctotal))
gen selogRR = sqrt(1/tcases +1/ccases -1/ttotal -1/ctotal)

gen logrr=ln(rr)
gen selogrr=(ln(ul)-ln(ll))/3.92

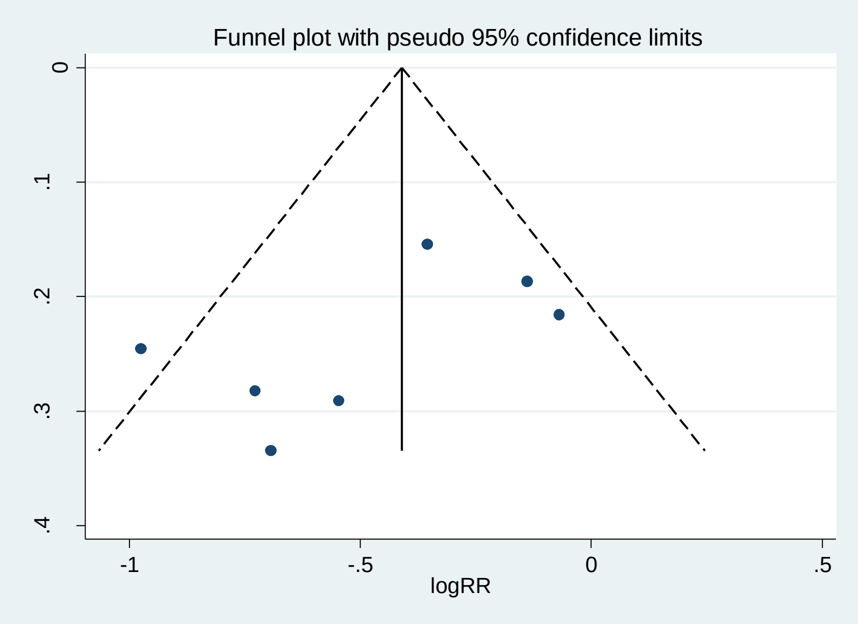
Introduction to the "metafunnel" Module

圖像化評估Publication Bias: Funnel Plot

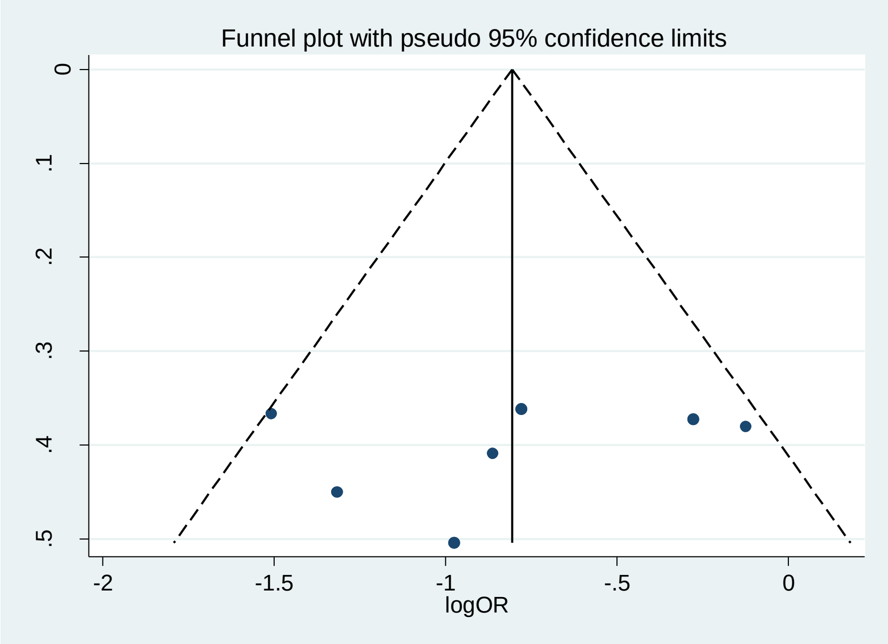
search(metafunnel)
search(metabias)

insheet using "C:\Users\VGH00\Downloads\20231219-初探Meta-analysis\data\afreg.csv", clear

metafunnel logrr selogrr



metafunnel logor selogor



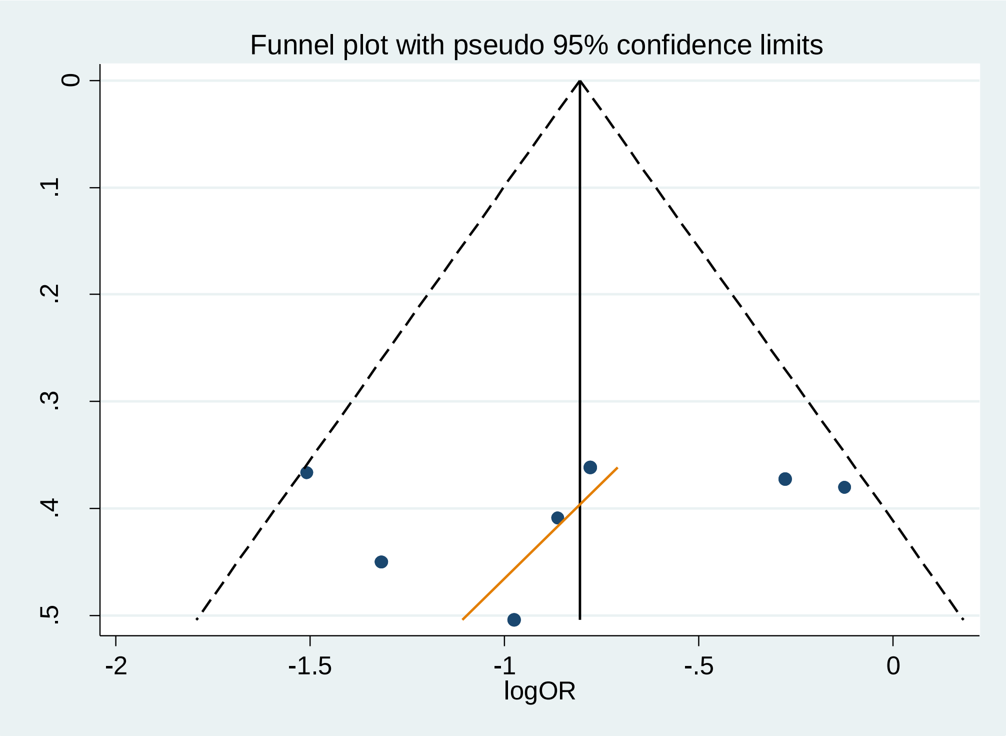
Introduction to the "metafunnel" Module

圖像化評估Publication Bias: Funnel Plot
→ Small size effect: Egger's test

search(metafunnel)
search(metabias)

insheet using "C:\Users\VGH00\Downloads\20231219-初探Meta-analysis\data\afreg.csv", clear

metafunnel logor selogor, egger



metabias logor selogor, egger

```
. metabias logor selogor, egger graph

Note: default data input format (theta, se_theta) assumed.

Tests for Publication Bias

Begg's Test

  adj. Kendall's Score (P-Q) =     -12
          Std. Dev. of Score =   18.27 (corrected for ties)
           Number of Studies =      14
                           z =   -0.66
                    Pr > |z| =   0.511
                           z =    0.60 (continuity corrected)
                    Pr > |z| =   0.547 (continuity corrected)

Egger's test
```

Std_Eff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
slope	.3068297	1.247459	0.25	0.810	-2.41115	3.024809
bias	-2.8082	3.130834	-0.90	0.387	-9.629702	4.013302

研究出現高異質性怎麼辦?

- 不要先急著作統合分析
  - ☐ 統合性迴歸分析（meta-regression）
  - ☐ 次群組分析（subgroup-analysis）：找出具有明顯的 category 差別的變項
    - ➢ 總論文數小於10篇以下，盡量不要作統合性迴歸分析 → Egger’s test
  - ☐ 敏感度分析（sensitivity analysis）：
    - ➢ 將某些不合適的論文（例如壁報或品質差的論文） 刪除
  - ☐ 使用Random effect model

若有 Publication Bias，則做 Meta-regression去看是否有差異？

search (metareg)
ssc install metareg

metareg logrr af_duration_month age male lad htn dm, wsse(selogrr)

wsse: weighted sum of squared error

```
. metareg logrr af_duration_month age male lad htn dm, wsse(selogrr)
Iteration 1: tau^2 = 0

Meta-analysis regression                          No of studies =   10
                                                  tau^2 method     reml
                                                  tau^2 estimate =    0

Successive values of tau^2 differ by less than 10^-4 :convergence achieved
```

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
af_duratio~h	.0069913	.0062484	1.12	0.263	-.0052554	.019238
age	-.0232773	.030965	-0.75	0.452	-.0839677	.037413
male	-.0134777	.0225799	-0.60	0.551	-.0577334	.0307781
lad	.0429541	.0383832	1.12	0.263	-.0322756	.1181838
htn	-.0103658	.0129599	-0.80	0.424	-.0357666	.0150351
dm	-.0009762	.02803	-0.03	0.972	-.055914	.0539615
_cons	.5510243	2.597312	0.21	0.832	-4.539614	5.641663

metareg logor af_duration_month age male lad htn dm, wsse(selogor)

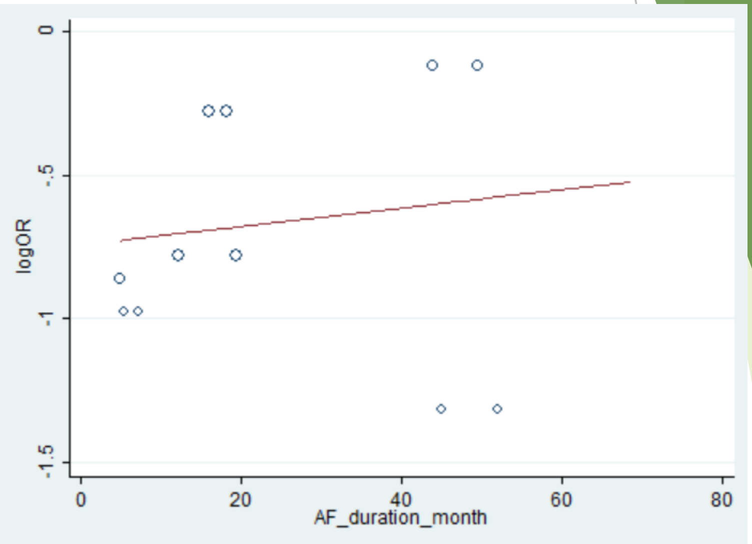
```
. metareg logor af_duration_month  age male lad htn dm, wsse(selogor)
Iteration 1: tau^2 = 0

Meta-analysis regression                          No of studies =   10
                                                  tau^2 method     reml
                                                  tau^2 estimate =    0

Successive values of tau^2 differ by less than 10^-4 :convergence achieved
```

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
af_duratio~h	.0129666	.0111359	1.16	0.244	-.0088593	.0347926
age	-.0597687	.0633236	-0.94	0.345	-.1838807	.0643433
male	-.0238221	.0421582	-0.57	0.572	-.1064507	.0588065
lad	.0711115	.0677096	1.05	0.294	-.0615969	.2038198
htn	-.0169151	.0224828	-0.75	0.452	-.0609806	.0271505
dm	.0013636	.0515917	0.03	0.979	-.0997543	.1024815
_cons	2.073794	5.095346	0.41	0.684	-7.912901	12.06049

insheet using "C:\Users\VGH00\Downloads\20231219-初探Meta-analysis\data\afreg.csv“, clear

若有 Publication Bias，則做 Meta-regression去看是否有差異？

search (metareg)



#單看特定變數會不會影響結局 (只能放一個變數)

AF duration會不會影響復發

metareg logor af_duration_month , wsse(selogor) graph

wsse: weighted sum of squared error

```
. metareg logor af_duration_month , wsse(selogor) graph

Meta-regression                                    Number of obs  =        12
REML estimate of between-study variance            tau2           =    .02237
% residual variation due to heterogeneity          I-squared_res  =    13.84%
Proportion of between-study variance explained     Adj R-squared  =   -82.67%
With Knapp-Hartung modification
```

logor	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
af_duratio~h	.0032216	.0072379	0.45	0.666	-.0129054	.0193486
_cons	-.7446471	.2116059	-3.52	0.006	-1.216134	-.2731598

insheet using "C:\Users\VGH00\Downloads\20231219-初探Meta-analysis\data\afreg.csv“, clear

Introduction to the "metareg" Module

search (metareg)

For risk ratio (RR) → Log RR:

#三組資料 (RR, LL, UL)
metan rr ll ul,   random

#轉兩組資料 (logrr seloges)
gen logrr=ln(rr)
gen selogrr=(ln(ul)-ln(ll))/3.92

metareg logrr sex adjust, wsse(selogrr)

insheet using "C:\Users\VGH00\Downloads\20231219-初探Meta-analysis\data\nodm.csv ", clear

	source	year	adjust	sex	assess	rr	ll	ul	logrr	selogrr
1	Yarnell	1994	1	1	fasting	2.9	1.2	6.6	1.064711	.4348847
2	Park_M	1996	1	1	postchallenge	.83	.47	1.45	-.1863296	.2873944
3	Park_W	1996	1	0	postchallenge	1.01	.51	2	.0099503	.3485948
4	Folsom_M	1997	1	1	fasting	1.08	1.08	1.9	.0769611	.1441053
5	FolsomW	1997	1	0	fasting	.53	.18	1.55	-.6348783	.5492483
6	Lowe_Bl	1997	1	1	postchallenge	1.17	.66	2.1	.1570037	.2952685
7	Lowe_Wh	1997	1	1	postchallenge	1.04	.91	1.19	.0392207	.0684347
8	Balkau	1998	1	1	postchallenge	1.08	.79	1.5	.0769611	.1635682
9	Bjornholt	1999	1	1	fasting	1.4	1.04	1.8	.3364722	.1399403
10	Rodriguez	1999	1	1	postchallenge	1.08	.92	1.27	.0769611	.0822445
11	Wannamethee	1999	1	1	casual	1.86	1.11	3.13	.6205765	.2644574
12	DECODE Study Group_M	2001	1	1	postchallenge	1.34	1.12	1.6	.2926696	.0909885
13	DECODE Study Group_W	2001	1	0	postchallenge	1.28	.88	1.86	.2468601	.1909209
				0	postchallenge	.93	.57	1.51	-.0725707	.2485277
				1	fasting	1.44	1.09	1.9	.3646432	.1417541
				0	fasting	1.8	.2	14.7	.5877866	1.096246
				1	fasting	1.3	.7	3.3	.2623642	.3955606
				1	postchallenge	1.96	1.11	3.45	.6729445	.2892894
				1	casual	1.18	.57	2.49	.1655144	.3761229
				0	postchallenge	1.9	1.2	3.2	.6418539	.2502115
21	Cremer	1997	0	1	fasting	1.6	1.1	2.2	.4700036	.1768233
22	Hart_M	1999	0	1	casual	1.31	.75	2.3	.2700271	.2858651
23	Hart_W	1999	0	0	casual	2.18	1.44	3.29	.7793249	.2107766
24	Tominaga	1999	0	0	postchallenge	2.22	1.08	4.58	.7975072	.3685556
25	Simons_M	2000	0	1	fasting	1.08	.77	1.51	.0769611	.1718047
26	Simons_W	2000	0	0	fasting	1.52	1.08	2.15	.4187103	.1756395
27	Klein	2002	0	0	casual	2.31	1.4	3.82	.8372475	.2560659
28	Smith	2002	0	0	postchallenge	1.9	1.51	2.39	.6418539	.1171387

Successive values of tau^2 differ by less than 10^-4 :convergence achieved

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
sex	-.1259708	.1030285	-1.22	0.221	-.3279031	.0759614
adjust	-.2823985	.0972248	-2.90	0.004	-.4729556	-.0918414
_cons	.5611827	.0802269	6.99	0.000	.4039409	.7184244

Random-effects model

Introduction to the “metareg” Module

search (metareg)

若Meta-regression有差異 → 把有差異的那群分層去比較 (Sub-group analysis)

insheet using "C:\Users\VGH00\Downloads\20231219-初探Meta-analysis\data\nodm.csv “, clear

metareg logrr sex adjust, wsse(selogrr)

```
Successive values of tau^2 differ by less than 10^-4 :convergence achieved
```

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
sex	-.1259708	.1030285	-1.22	0.221	-.3279031	.0759614
adjust	-.2823985	.0972248	-2.90	0.004	-.4729556	-.0918414
_cons	.5611827	.0802269	6.99	0.000	.4039409	.7184244

Random-effects model

#Sub-group analysis (依adjust與否分層): Fixed-effect model
metan logrr selogrr, fixed eform by(adjust)

#Sub-group analysis (依adjust與否分層): Random-effects model
metan logrr selogrr, random eform by(sex)

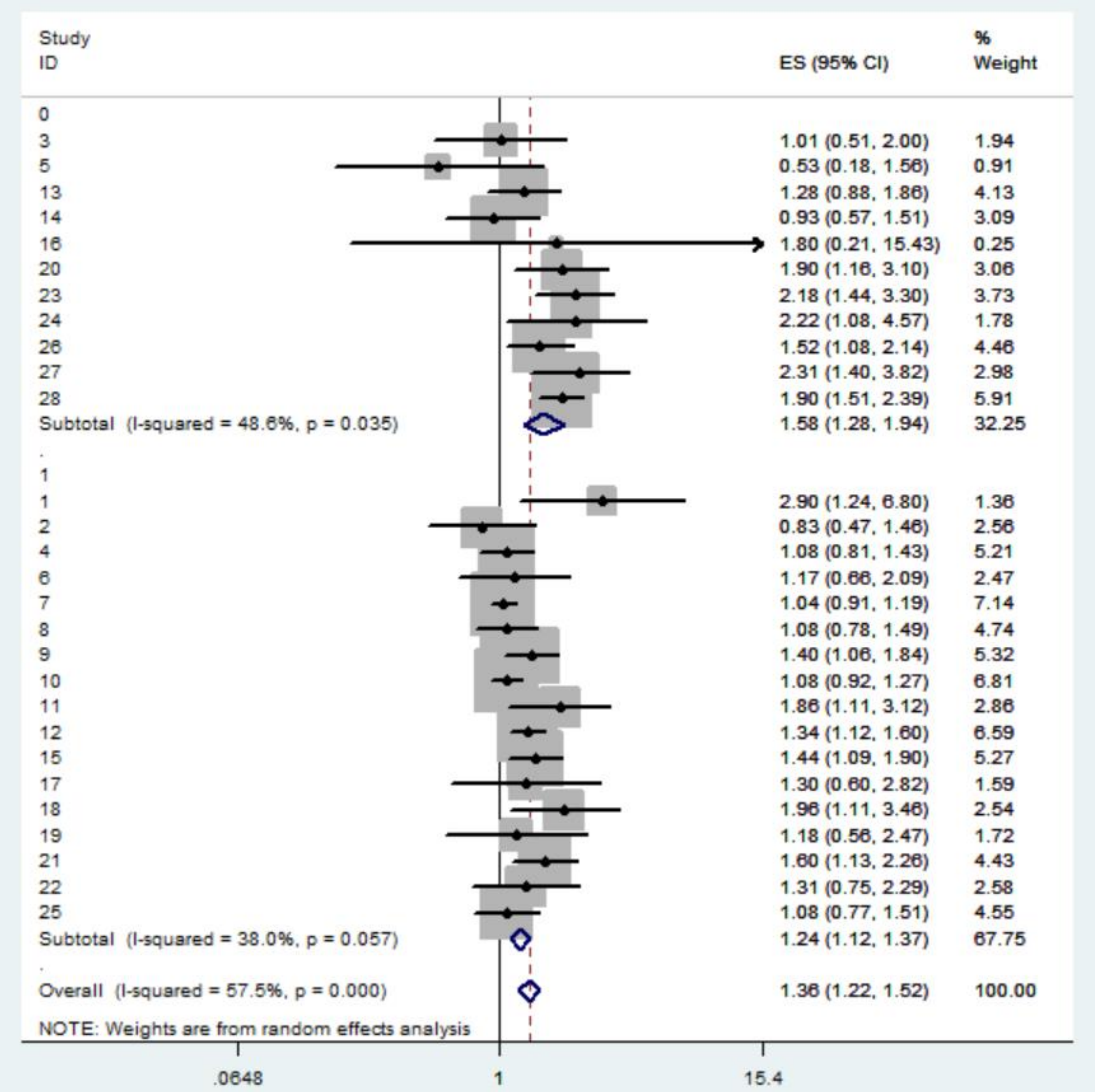
若Meta-regression有差異 →
把有差異的那群**分層**去比較 (Sub-group analysis)

insheet using "C:\Users\VGH00\Downloads\20231219-初探Meta-analysis\data\nodm.csv ", clear

#Sub-group analysis (依adjust與否分層):
Random-effects model
metan logrr selogrr, random eform by(sex)

ef: Exp form

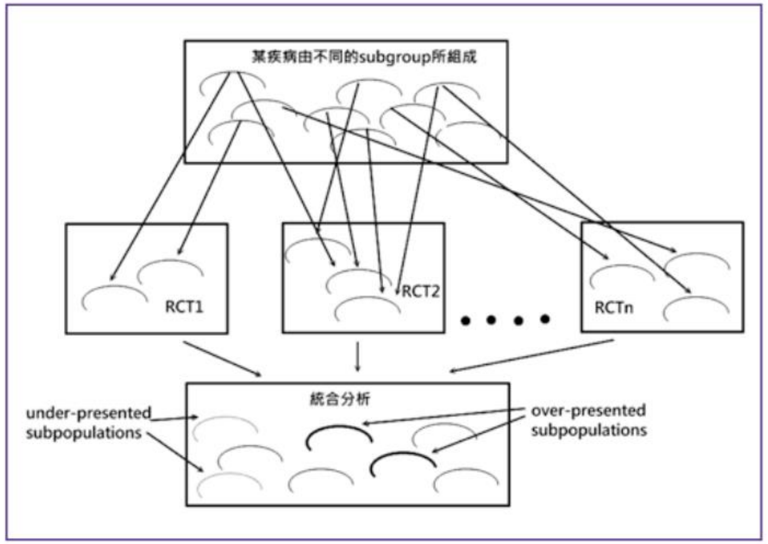
```
Test(s) of heterogeneity:
              Heterogeneity  degrees of
                statistic     freedom      P    I-squared**   Tau-squared

0                 19.46         10      0.035     48.6%        0.0514
1                 25.81         16      0.057     38.0%        0.0140
Overall           63.52         27      0.000     57.5%        0.0389
** I-squared: the variation in ES attributable to heterogeneity)

Note: between group heterogeneity not calculated;
only valid with inverse variance method

Significance test(s) of ES=1

0                     z=   4.32       p =  0.000
1                     z=   4.16       p =  0.000
Overall               z=   5.51       p =  0.000
--------------------------------------------------------------------------
```



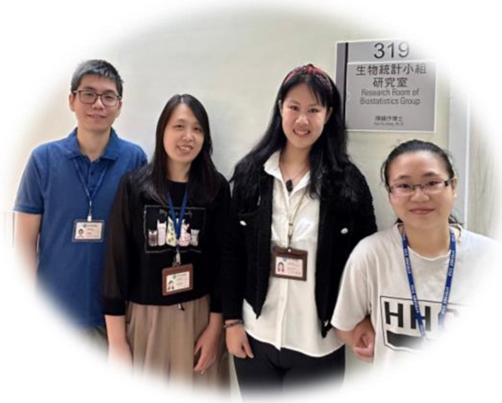
總結

- 僅由單一個隨機分派研究的結果來下結論是一種比較危險的行為，萬一這個結果有隨機錯誤時（error by chance），我們就有可能對某個醫學議題造成誤判。
- 統合分析可以提供較客觀的整合分析結果，對於不合適的研究我們也可藉由敏感性分析將其剔除，而使分析結果更正確。
- 隨機分派研究與觀察性研究的證據強度（level of evidence）是不同的，我們在看一篇統合分析的論文時一定要注意所選取論文的研究種類、品質、和訊息強度。

統合分析和隨機分派研究論文結果牴觸的可能原因:
某些特定族群被過度呈現



生統小組：統計方法教育訓練



12/19問卷

Thank you for listening